



**Forensic Building Science, Inc.**  
657 Lincoln Avenue St., Paul Minnesta 55015

### Project Information

<b>Client:</b> Hollingsworth Investments VI	<b>Insurance Carrier:</b> Cincinnati Insurance Company
<b>Project Address:</b> 88 Armory Road Vicksburg, Mississippi 39183	<b>Policy #:</b> Unknown <b>Claim #:</b> 2831900
Warren County	<b>Date of Loss:</b> August 8, 2015 <b>Claim Type:</b> Hail, Wind, Water

### FIELD REPORT FOR INITIAL STORM DAMAGE INVESTIGATION

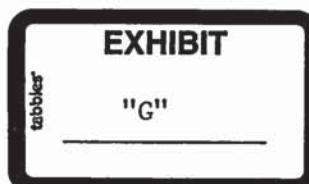
#### 1.0 Background Information:

Forensic Building Science, Inc. (FBS) was contacted by Hollingsworth Companies to provide an inspection of the roof system at the above-mentioned property to ascertain the extent of damage caused by hail, wind and rain, which was discovered in January of 2017 when Mr. J. D. King, Director of Construction for The Hollingsworth Companies inspected the property after a January 21, 2017 hail event.

The building was purchased in July of 2015 and as part of their due diligence Mr. King inspected and photo documented the roof conditions on July 8, 2015. At that time, no hail damage was observed. These photos were forwarded to FBS as part of our inspection for purposes of comparing the presale condition at or around the time of purchase and the condition discovered in January of 2017 by Mr. King [See **Client Photos dated July 8, 2015 and February 1, 2017**]. The date the damage occurred is in question and has been reported by Haag Engineering in their report to have predated the purchase of the property.

Based on our review of the photos provided by Mr. King from his January 21, 2017 inspection and the build up of a brown colored sediment in the hail caused indentations, the damage he saw and Haag reported as rust likely was not caused by the January 21, 2017 event. In fact, this condition was not observed by FBS. The color of the sediment observed at that time was likely due to a pollutant from the near by rendering plant.

FBS was asked to conduct research on weather events between the date of purchase on July of 2015 and the date of discovery of the damage in January of 2017. Mr. Irmriter is a trained NOAA weather spotter and has specific training on accessing and researching NOAA Severe Weather Inventory data.



## 1.1 NOAA Hail Research Conducted by FBS:

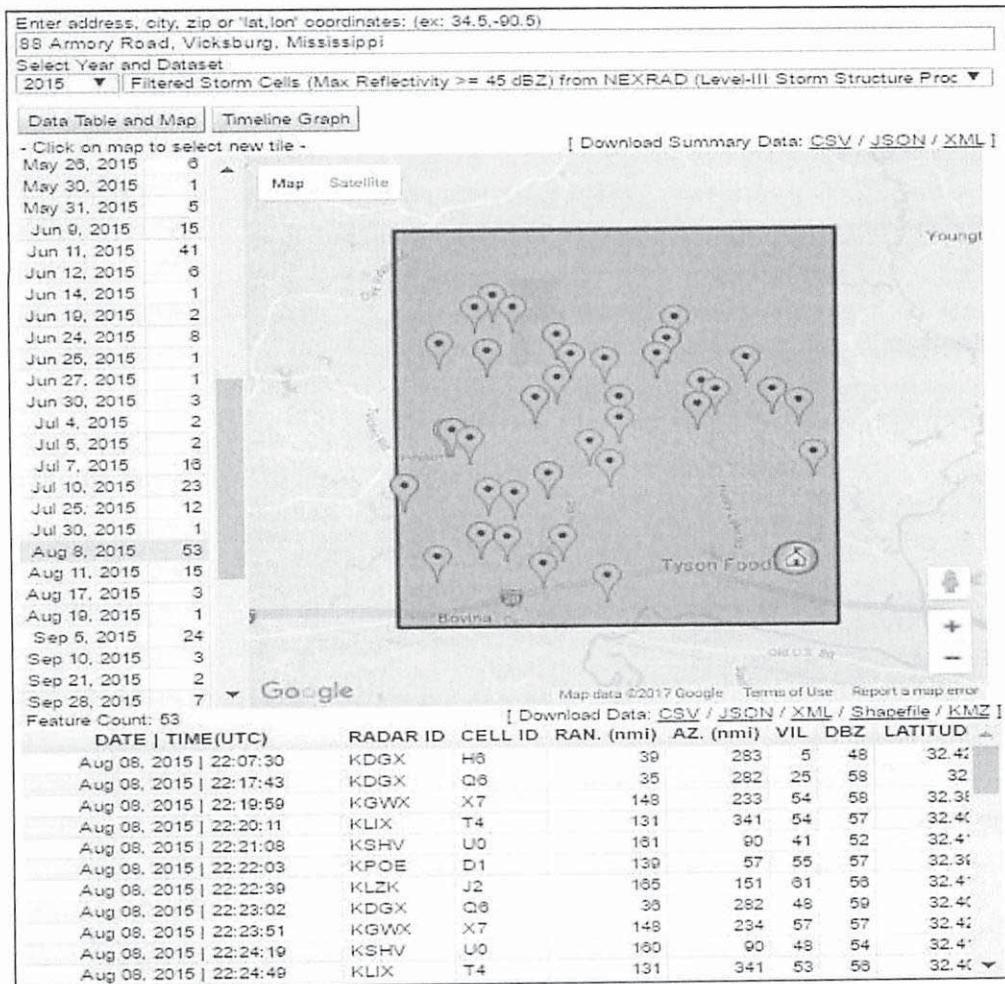
The Haag reports lists a number of storm dates starting as early as 1999. For reasons unknown to FBS there is a gap in their reported storm dates stopping at June 30, 2015 and then starting back up again in December 24, 2015. Coincidentally, Hollingsworth changed insurance coverages on January 22, 2016. FBS located a severe weather event which occurred at and around the property during the period Haag failed to include.

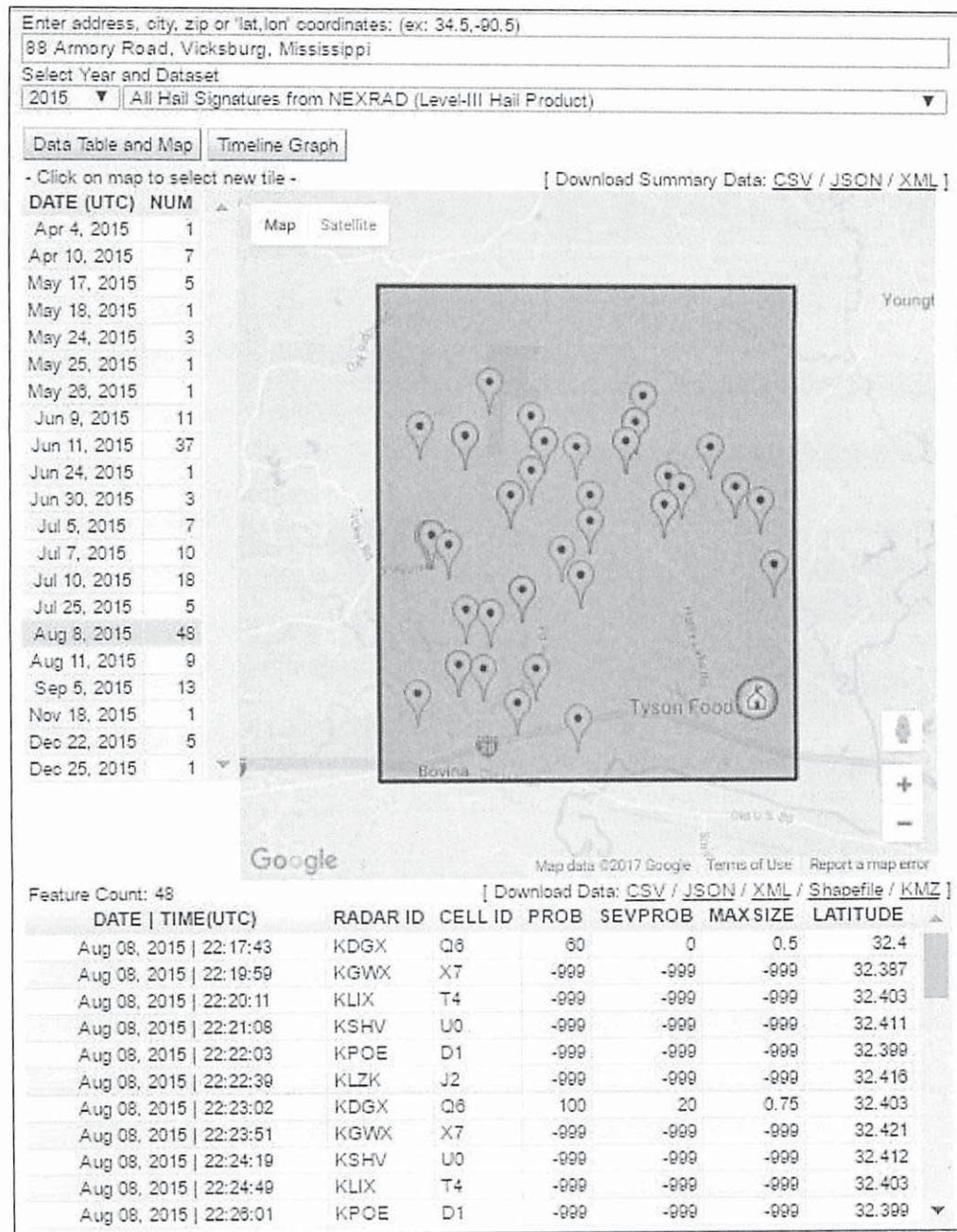
## 1.2 Reference Information on August 8, 2015 Storm Event:

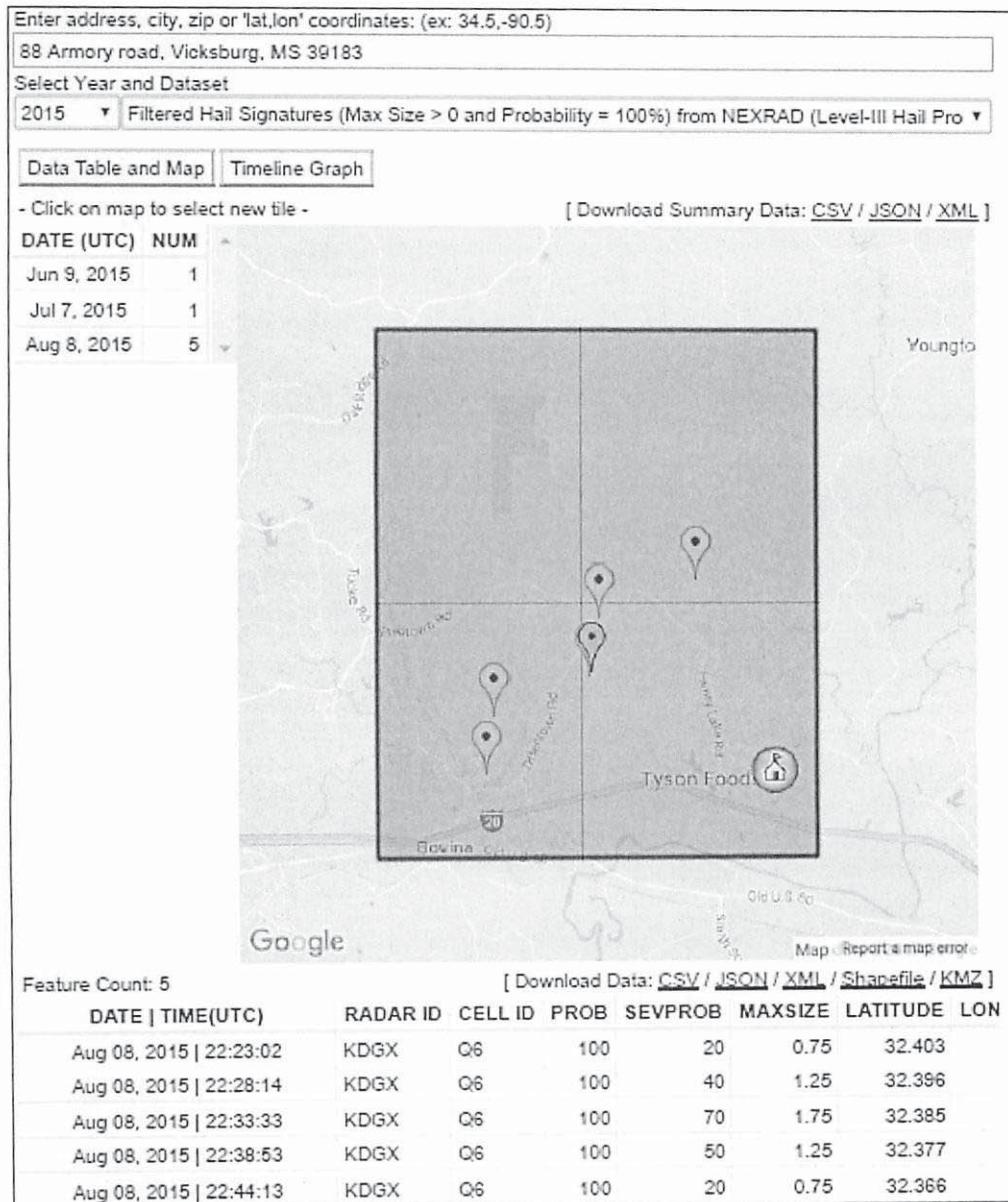
### **NOAA Severe Weather Data Inventory for Nearby Storms on August 8, 2015:**

According to the National Oceanic and Atmospheric Administration's (NOAA) storm event database, a total of 53 storm related events and 48 hail related events are recorded for August 8, 2015 near the facility. This is the largest concentration of storm activity in all of 2015 and 2016 for this location. Hail was recorded at 1.75 inches less than 3 mile from the site with the storm moving toward the site.

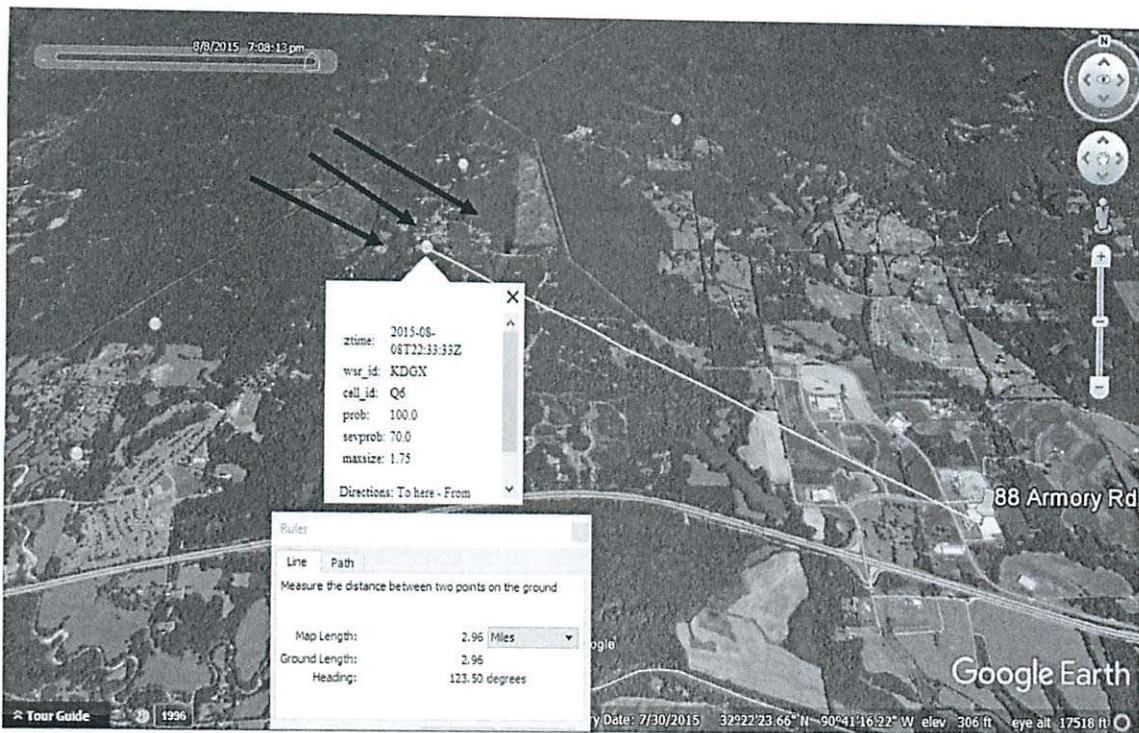
### **NOAA Severe Weather Inventory Filtered Storm Cells August 8, 2015:**



**NOAA Severe Weather Inventory All Hail Signatures August 8, 2015:**

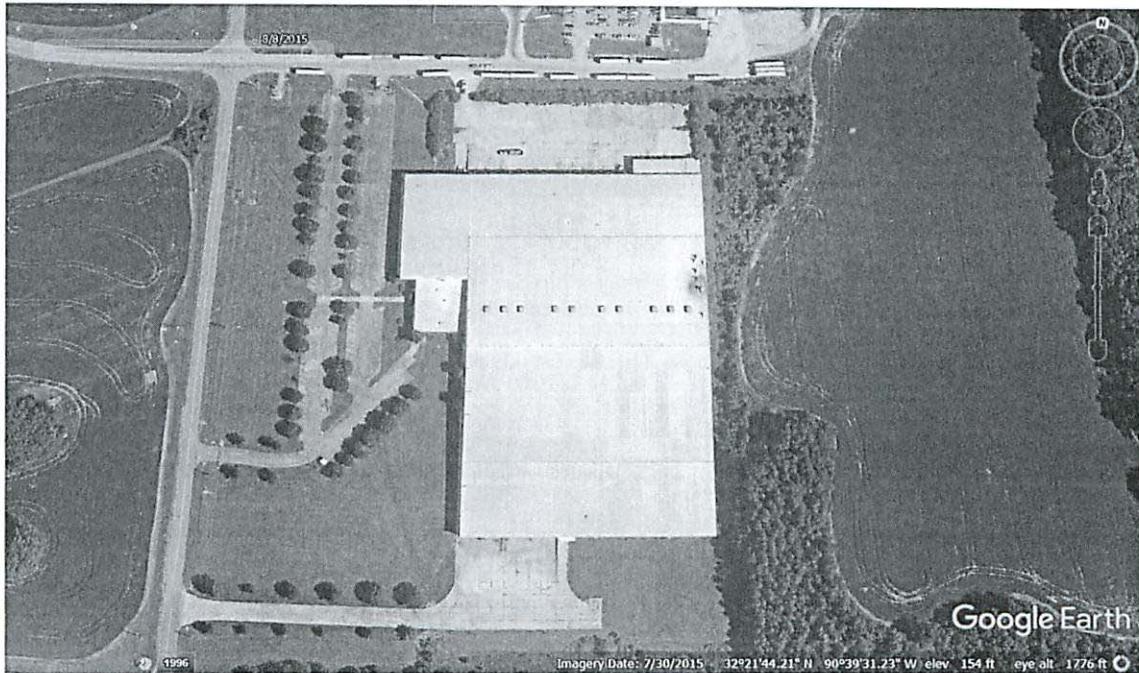
**NOAA Severe Weather Inventory Filtered Hail Signatures August 8, 2015:**

1.75 Inch hail at green balloon



Google Earth image of hail events (green dots) reported on August 8, 2015. The closest storm event is approximately 2.96 miles northwest of the property [Yellow pin]. Black arrows showing storm direction.

### 1.3 Satellite Image of the Property:



Google Earth imagery before the storm event(s) dated July 30, 2015.

FBS personnel visited the site to take photos and document damage to the location(s). These photos are attached to this report.

1.4 **Inspection personnel present:**

- Tom Irmiter, President, Forensic Building Science, July 19, 2017

1.5 **The following claim related documents have been received:**

- Affidavit for Joseph A. Hollingsworth, Jr.
- Affidavit for John D. King
- Affidavit for Dominic Scarneccia, dated June 5, 2017
- CoreLogic, Hail Verification Report, dated April 10, 2017
- EagleView, Pre-pitch 2D Report, dated February 2, 2017
- Material Engineering and Testing Corporation, Metallography Test Report, dated June 30, 2017
- Draft of Donan Engineering, Roof Evaluation Report, dated March 4, 2017
- Haag Engineering, Roof Evaluation Report, dated March 2, 2017
- Rimkus Consulting Group, Inc., Roof Evaluation Report, dated May 19, 2017

1.6 **The following additional documents were used for reference:**

- According to the City of Vicksburg website, they have adopted the following building codes (which became effective June 1, 2015):
  - 2012 International Building Code with local amendments
  - 2012 International Mechanical Code with local amendments
  - 2012 International Fuel Gas Code with local amendments
  - 2012 International Plumbing Code with local amendments
  - 2012 International Property Maintenance Code with local amendments
  - 2012 International Existing Building Code with local amendments
  - 2011 National Electrical Code with local amendments
  - Amendments can be found here:  
<http://www.vicksburg.org/departments/building-and-inspection/building-and-inspection-67107>
- Haag Education Haag Certified Roof Inspector Program, Commercial Edition.
- ASTM E2128-09a Standard Guide for Evaluating Water Leakage of Building Walls
- Haag Engineering: Hail Damage Threshold Sizes for Common Roofing Materials.
- Classic Metal Roofs, LLC: An Insider's Guide to Metal Roofing
- FEMA: Metal Roof Systems in High-Wind Regions
- Rob Haddock: Sealing and Flashing Metal Roofs
- MCA: Metal Roof Installation Manual
- MCA: Static and Dynamic Analysis of Metal Roof Systems
- MCA: Roof Covering Repair Requirements and the International Codes

## 1.0 Structure Information:

According to the Warren County Appraisal District website, the building at 88 Armory Road was originally constructed around 1999 and was purchased by the Hollingsworth Company during July 2015. Based on the information obtained from the EagleView report the roof area was estimated to be 308,000 ft<sup>2</sup>. The building is considered to face towards the west. The single-story building is a concrete tilt up panel/steel-framed commercial structure built over a concrete slab-on-grade foundation. The roofs are covered with a galvalume coated standing-seam roofing system with a roof slope pitched less than 1:12. The taller, gable-type roof covered a majority of the structure, while the office area had a lower overall height. Front and rear walls extended above the main roof surface and sloped towards the north and south edges where a gutter system was in place. Metal cap flashing was installed along the front and rear wall tops. The lower front roof section was surrounded by walls on all sides, and sloped to the south where a gutter system was positioned between the wall and the roof edge. Large metal cap ventilators are located on roof # 5 above the main warehouse.



*Google Earth imagery of terrain surrounding property dated July 30, 2015.*

- Area is surrounded by properties consistent with the definition of Exposure C in ASCE 7.

## 2.0 Site Observations:

*Note: “impact damage” is typically used to reference only damage caused by hail from a storm event.*

## 2.1 Interior Observations

Interior damage consisted of the following:

- Water damage to roof insulation in isolated areas.
- Plastic window panels blown out in 3 locations.

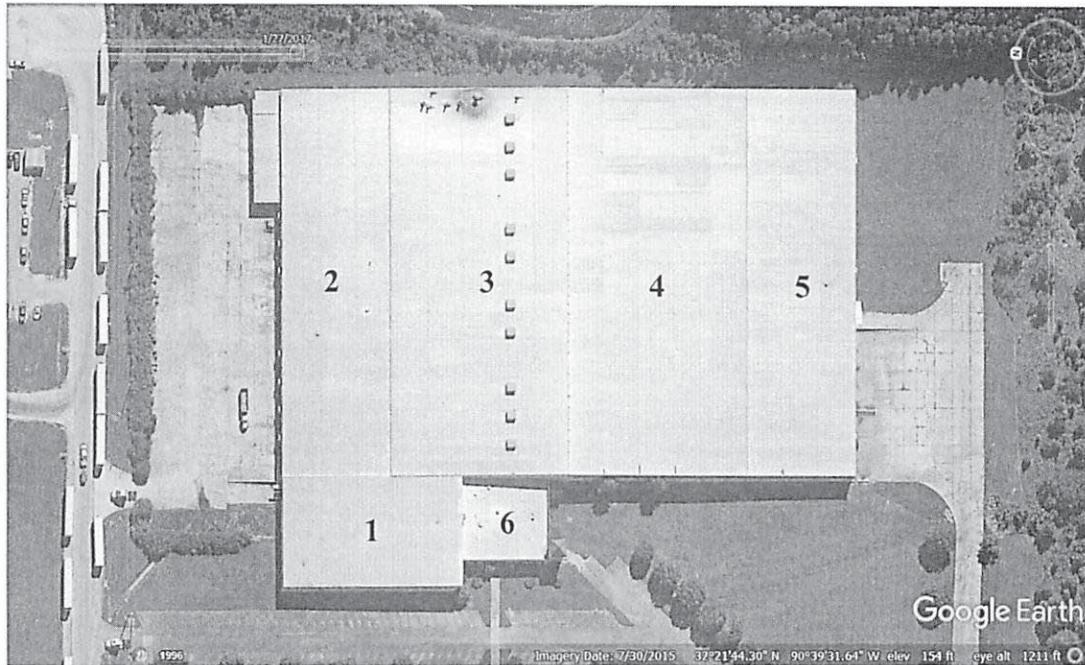
## 2.2 Roof Observations

The entire roof was inspected for damage relating to the storm event that likely occurred on August 8, 2015. The extent of damage varied as one would expect. We walked across the roof surface from end to end and a representative number of damaged areas were photographed and documented. These photos document hail damage consistent with the reported storm event details listed in the NOAA reports in section 1.1 of this report. "Sample squares" were used to quantify the damages and compare counts taken by Haag, Rimkus and Donnan. While the entire roof was fully inspected, it was not fully marked due to both time and cost constraints and the thousands of impact strikes. Additional photos of the roof damage were taken by the owners representative prior to our inspection. Recent rains had cleaned sediment from a number of hail strike locations. Larger and deeper indents from hail still had some sediment within the indentation. Some strikes affected the top rib sections. On other rib sections some signs of crimping related to either foot traffic or wind uplift were observed. Indentations could be seen from the interior at locations where insulation had fallen away exposing the underside of the metal decking.

Hail impact damage to the metal roofing panels caused the galvalume coating to etch due to stretching of the metal at a majority of the impact location. The size and depth of these indentations were consistent with very hard hail in excess of 1.50 inches in size. In addition, due to the low slope of the roof, water and pollution have collected in over 2/3 of the indented areas causing premature corrosion to occur. This could be viewed when the pollutants were removed, close up photos were taken and the photos are enlarged.

Damage related to hail and wind includes, but may not be limited to, the following:

- Impact damage to soft metal roof penetrations.
- Impact damage to 14-16-gauge thick metal ventilators.
- Impact damage to the metal panel roof.
- Impact locations in metal roof panels were discolored with sediment pollution. Close-up photos after the pollution debris were removed showed signs of possible damage to the coating and initial stages of corrosion at outer edge where metal was pushed downward.



*Google Earth imagery with numbered roof sections for corresponding sample squares.*

Sample Squares:

Three 10' x 10' sample squares were performed on the roof sections. The following data was recorded:

Sample Square #1: Middle Roof Section 1

- 60+ impacts to the standing-seam roofing
- Corrosion on edges of multiple indentations
- See figures Inspection Photo Log 07-19-17 TJI

Sample Square #2: Middle Roof Section 2

- 58+ impacts to the standing-seam roofing
- Corrosion on the edges of multiple indentations
- See figures - Inspection Photo Log 07-19-17 TJI

Sample Square #3: Middle Roof Section 3

- 52+ impacts to the standing seam-roofing
- Corrosion on the edges of multiple indentations
- See figures Inspection Photo Log 07-19-17 TJI

### **3.0 Causation Statement:**

Based on our inspection of the roof systems, we have concluded that the standing seam panels, soft metal covers and ventilator covers are damaged as a direct result of the August 8, 2015 storm event and must be completely replaced. Based on our education, training, experience, and the condition of the indentations at the time of our inspection, which took place on July 19, 2017, on August 8, 2015 there was sufficient hail to cause the above-referenced damage. Damage to the standing seam metal roofs has accelerated corrosion at several impact locations.

Failure to address the storm-damaged roof at the property will result in additional damage due to water intrusion. In our opinion, additional costs to repair will be required to meet the current required code or manufacturer's installation instructions. Based on our inspection of the interior, there is water intrusion occurring at isolated locations.

### **4.0 Review of Report Provided by METC**

Materials Engineering and Testing Corporation [METC] tested samples of hail indentations taken from the roof standing seam roof assembly. They conclude the following:

*"The data from the clean areas of these samples show a continuous Al-Zn coating of an iron sub-straight. The EDX data indicates that the coating is protecting the sub-straight from oxidation/rust. The damaged areas show corrosion with iron peaks larger than the clean areas indicating that the protective coating has been breached and the roof surface is corroding in these areas."*

**FBS Comment:** Based on our site inspection and review of our own close up photos we would concur.

### **5.0 Review of Haag Report**

Haag dose not disagree that there is damage to the roof system caused by hail. Although much of their report focuses on cosmetic vs. functional damage, which is consistent with every Haag report FBS has reviewed. Haag did nothing to look at the change in the galvalume coating or the effects of the hail to the actual metal from the indentations caused by the hail.

Haag states:

*"We researched information in the Storm Events Database for Warren County and Hinds County hail events between July 1, 2015, and November 30, 2016."*

**FBS Comment:** If that were the case than why did Haag omit any weather data between June 30, 2015 and December 23, 2015 in the data they presented in their report.

Haag states in their conclusions:

*"The dents were too small to reduce the water-shedding ability of the roof, and they would not reduce the expected service life of the roof. For these reasons, we determined there was no hail-caused damage to the roof."*

**FBS Comment:** Areas where no indentations from hail has occurred were free of sediment, pollutants and showed no signs of damage to the galvalume coating of metal decking. Over 2/3rds of the indentations had sediment within the indentation consistent with impedance of the flow of water allowing the sediment to collect in the indentations and cause additional accelerated damage to the metals.

## **6.0 Conclusions:**

Based on our review of the preloss photos, our site inspections and the condition of the hail impact indentations at the time of our inspection the damage did not occur on January 21, 2017. In our opinion, hail reported at or near the site by others from a March 2016 hail event was too small to cause the damage we saw. The severity of the storm event on August 8, 2015 more likely than not caused the damage.

In our opinion, based on the age of the buildings and changes to the building and energy codes from the date of original construction to the date of loss, additional costs to repair will be required to meet the current required code and manufacturer's installation instructions.

Recognized definitions of damage state that any "disadvantage or loss of value, use and longevity" constitutes damage. FBS maintains that the hail has certainly devalued the roof system and the worth of the building. The roof system's longevity is in question after the hail storm. The "pockets" created by the hail impacted dents will allow water to stand on the roof, and this has proved to be detrimental to the panel surface.

FBS believes that there is sufficient evidence that the hail from the storm event likely caused the kind of damage to warrant the replacement of all of roof system. The observed damages most definitely have a monetary effect on the property value(s) to the owner in future discussions and planning.

**Scope of Repair Discussion:**

Insulation installed during the original construction sequencing is placed onto the roof purlins prior to the installation of the standing seam metal roof panels. This insulation will typically be damaged when the roof panels are removed, requiring installation of new insulation. Changes in standing seam metal roof panel systems put in place to address changes in both energy codes and building codes specific to wind design make surgical repairs impossible. We did not find any individual panels with no hail damage. Additional insulation will need to be added above deck to meet current energy codes. Installation below deck will interfere with sprinkler heads. Added costs for engineering design will be required for wind load and roof attachments to accommodate raising panels for added insulation.

**7.0 Requirements / Recommendations:**

Based on the findings during the investigation, we recommend the following steps be taken:

1. Follow all applicable building codes.
2. On all roof slopes, remove all existing roofing materials and insulation down to the roof purlins.
3. Remove all insulation which will be damaged during re-roofing.
4. Replace all roofing materials, cap flashings and appurtenances with new. Include adding additional insulation to meet current National Energy Codes.  
**NOTE: THIS WILL REQUIRE INSTALLATION OF STANIONS  
ONTO PURLLINS TO ALLOW FOR 3" FOAM INSULATION TO  
MEET ENERGY CODES. THIS WILL REQUIRE ADDITIONAL  
ENGINEERING DESIGN FEES TO MEET WIND LOAD  
REQUIREMENTS.**
5. Remove and replace all gutters due to raising of roof.
6. Alternate construction techniques may be acceptable provided a licensed design professional approves, signs and stamps plans and or shop drawings for these repairs. Means and methods are the contractor's responsibility.
7. Conform to any special inspection and testing schedules issued by the engineer.
8. Contractor is solely responsible for adherence to all applicable safety requirements for work at heights.
9. Stability during construction is the responsibility of the contractor. Structure, as detailed, is intended to be stable once all sheathing and fasteners are in place.

Discovery is ongoing. Additional testing and inspections may need to be performed and additional and/or supplemental information and opinions may be contained in future reports issued by Forensic Building Science, Inc. This report is the exclusive property of the client noted previously and cannot be relied upon by a third party. Copies of this report are released to third parties only by written permission of the client.



Digitally Signed and Verified

Tom Irmriter, President

Building Failure Causation, Damages and Codes Consultant

July 25, 2017

Date

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*Client Photo Log – February 1, 2017*

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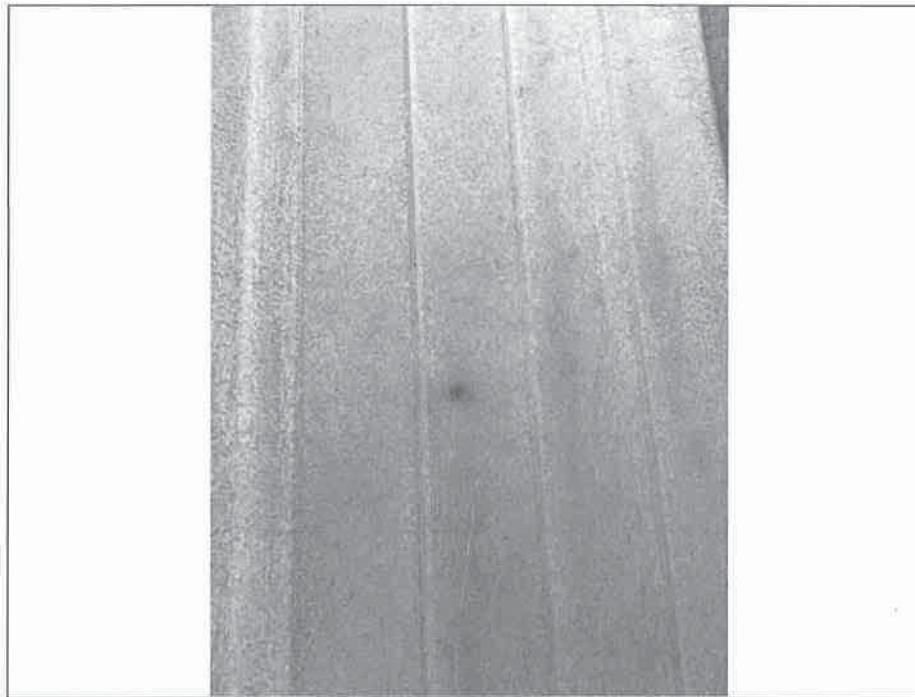


Figure 01. (X)

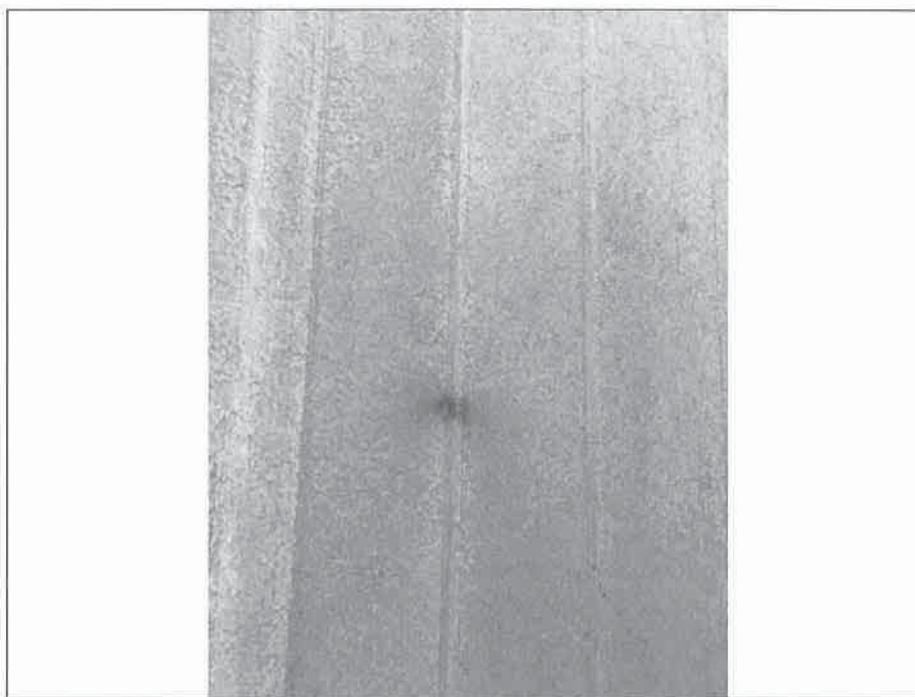


Figure 02. (X)

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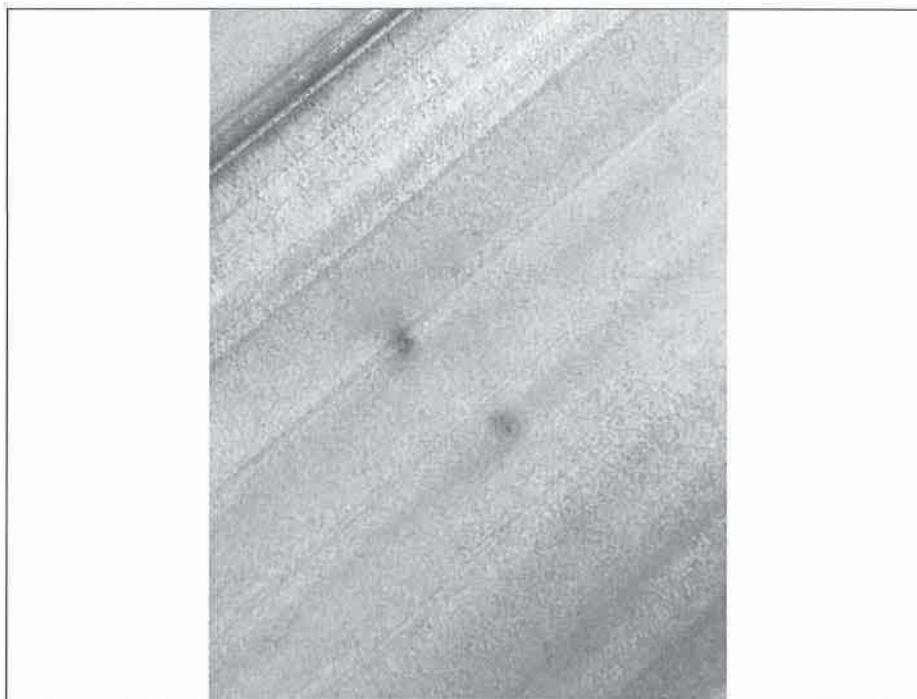


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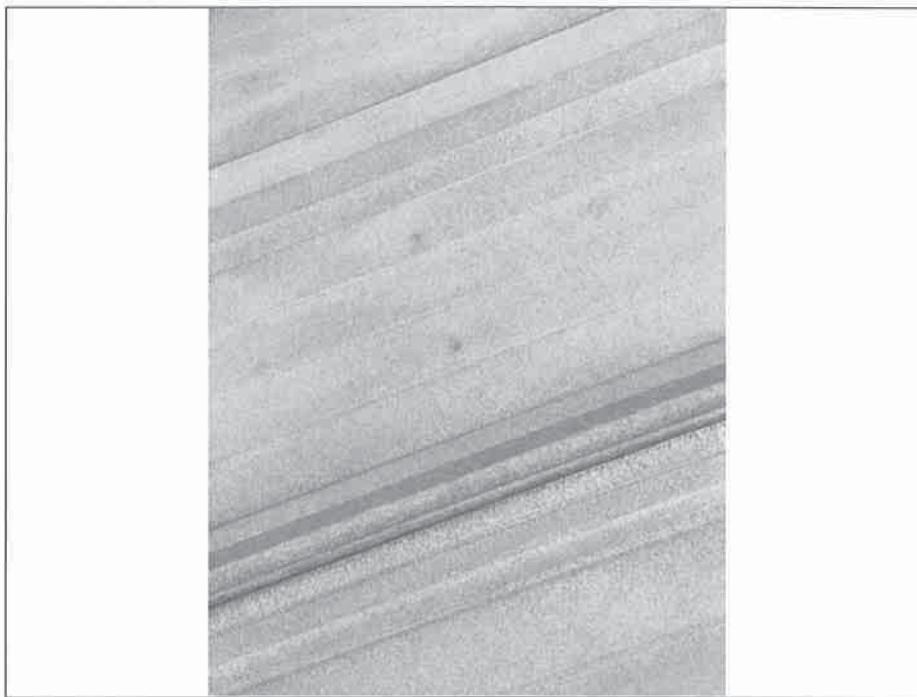


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Figure 05. (X)



Figure 06. (X)

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Figure 07. (X)



Figure 08. (X)

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Figure 09. (X)



Figure 10. (X)

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Figure 11. (X)



Figure 12. (X)

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Figure 13. (X)



Figure 14. (X)

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Figure 15. (X)



Figure 16. (X)

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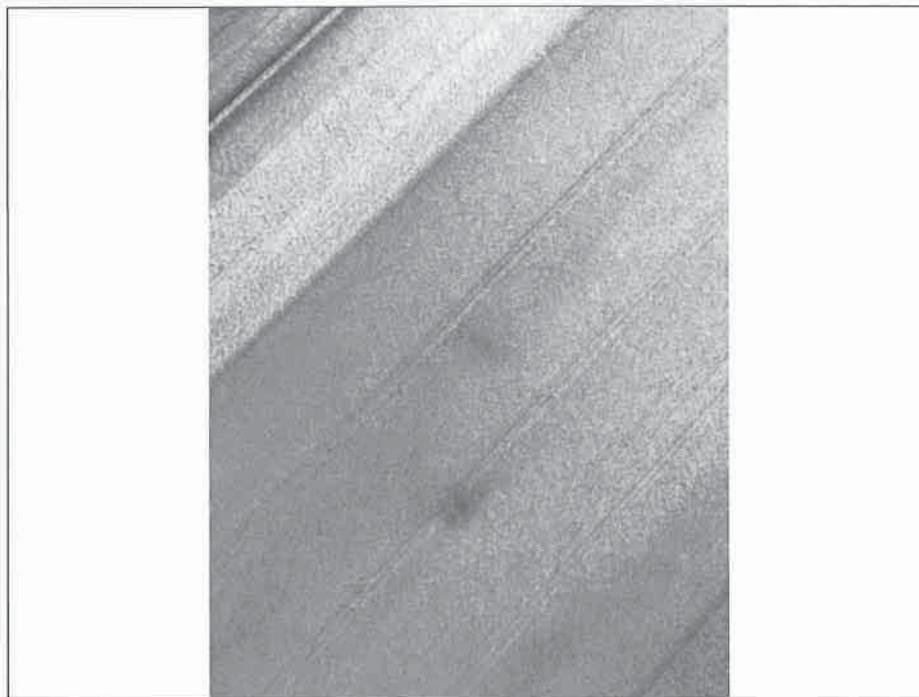


Figure 17. (X)



Figure 18. (X)

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Figure 19. (X)



Figure 20. (X)

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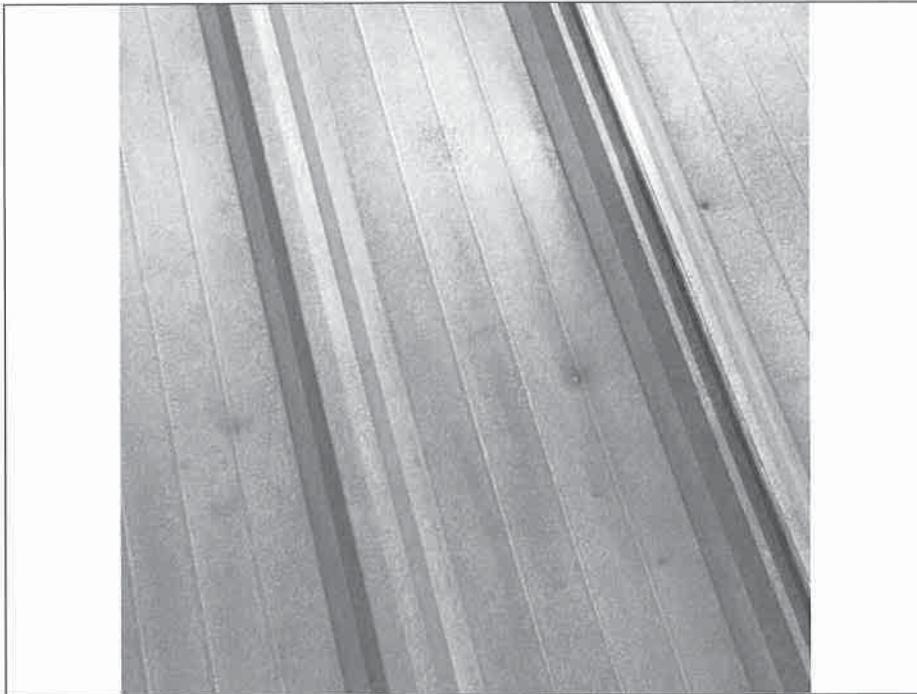


Figure 21. (X)



Figure 22. (X)

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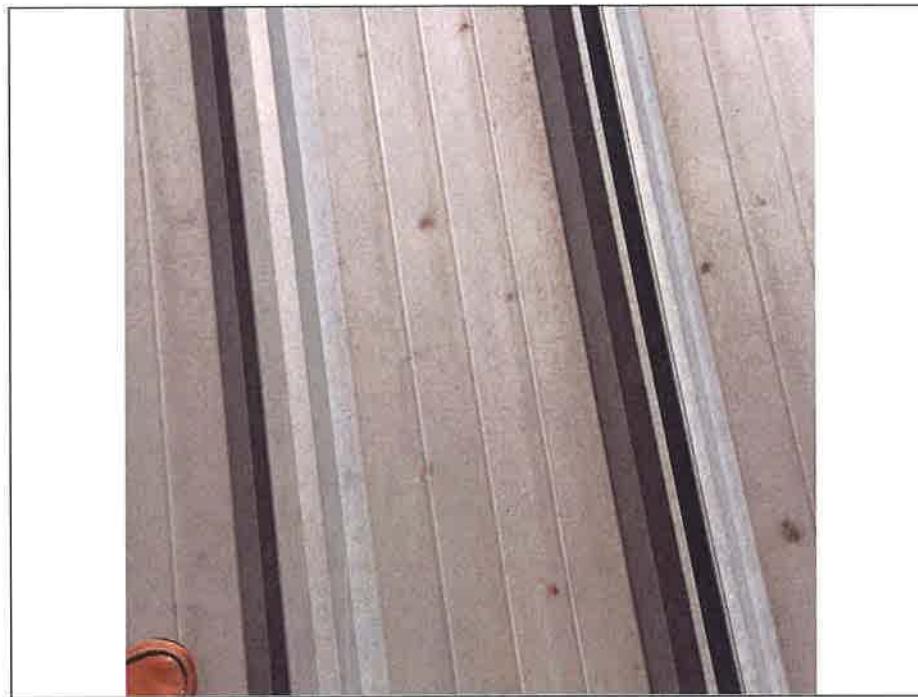


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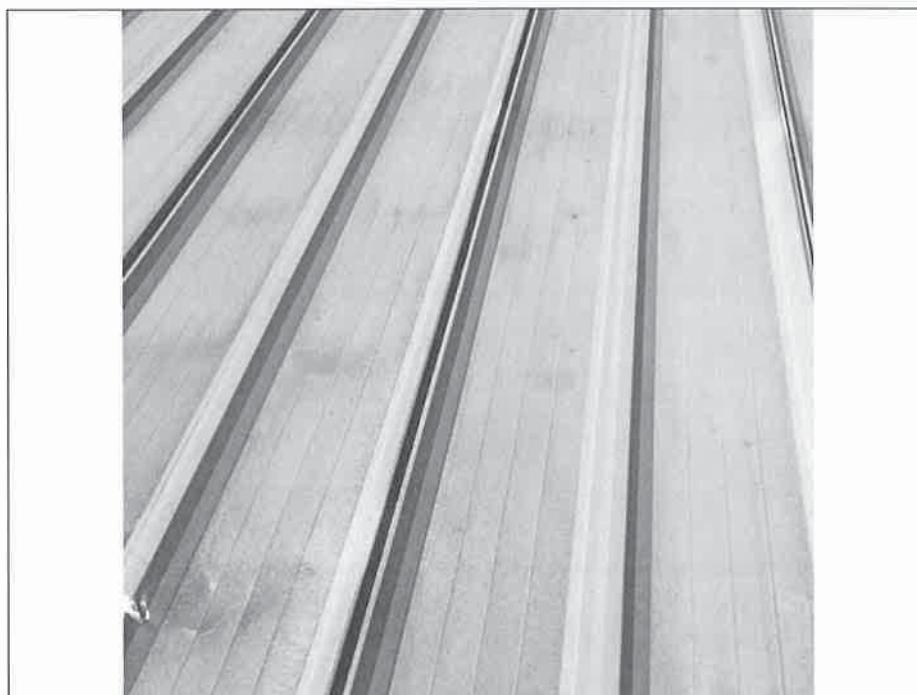


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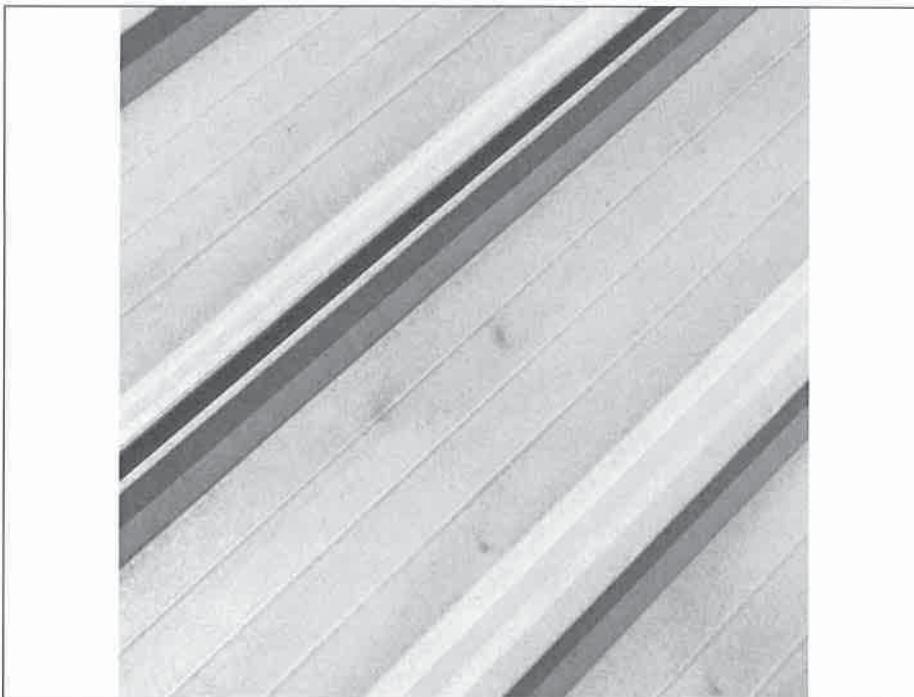


Figure 27. (X)



Figure 28. (X)

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Figure 29. (X)



Figure 30. (X)

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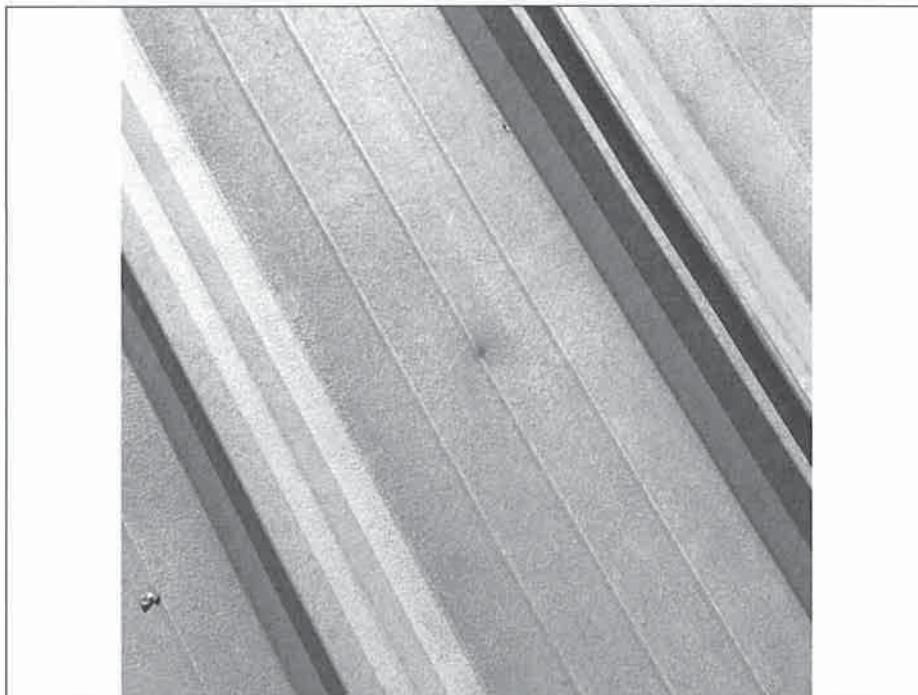


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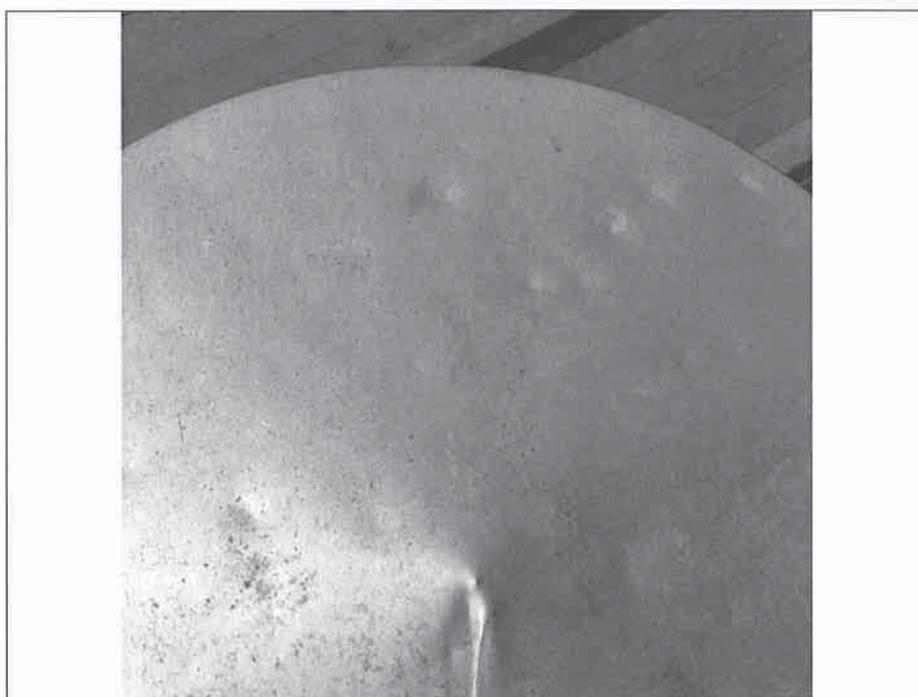


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Figure 33. (X)



Figure 34. (X)

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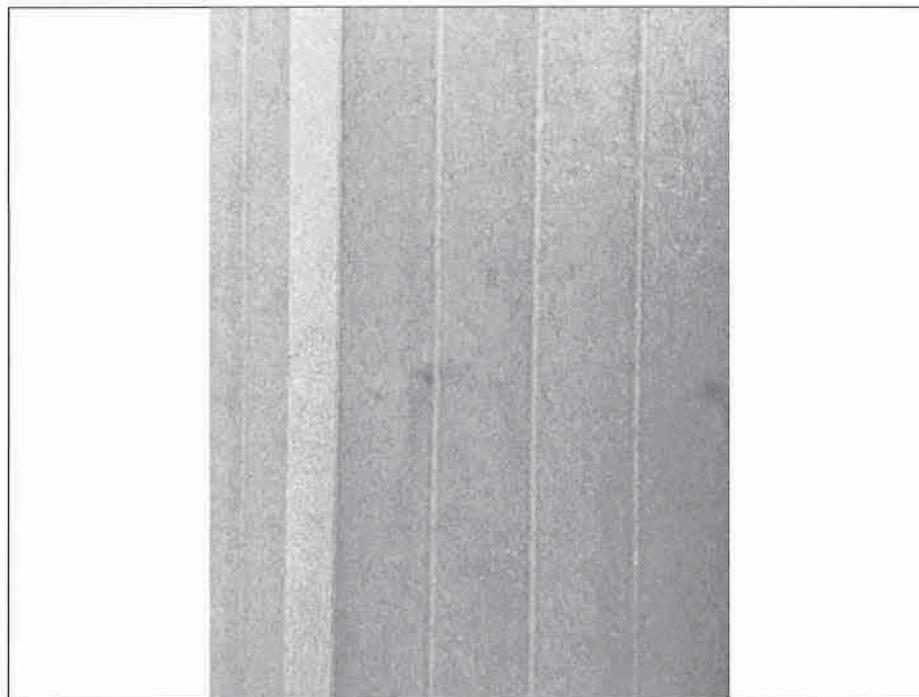


Figure 35. (X)



Figure 36. (X)

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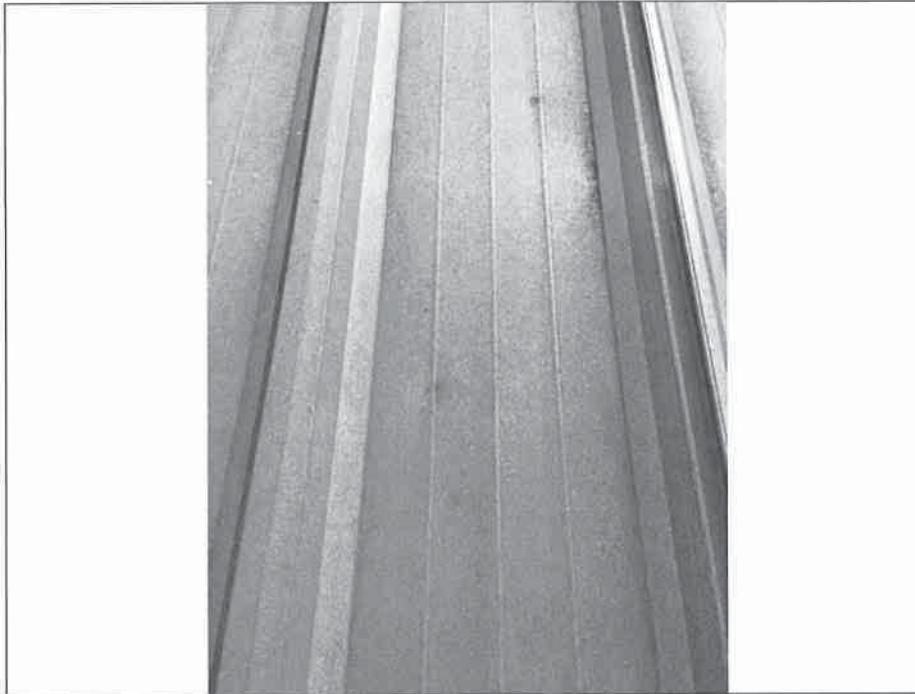


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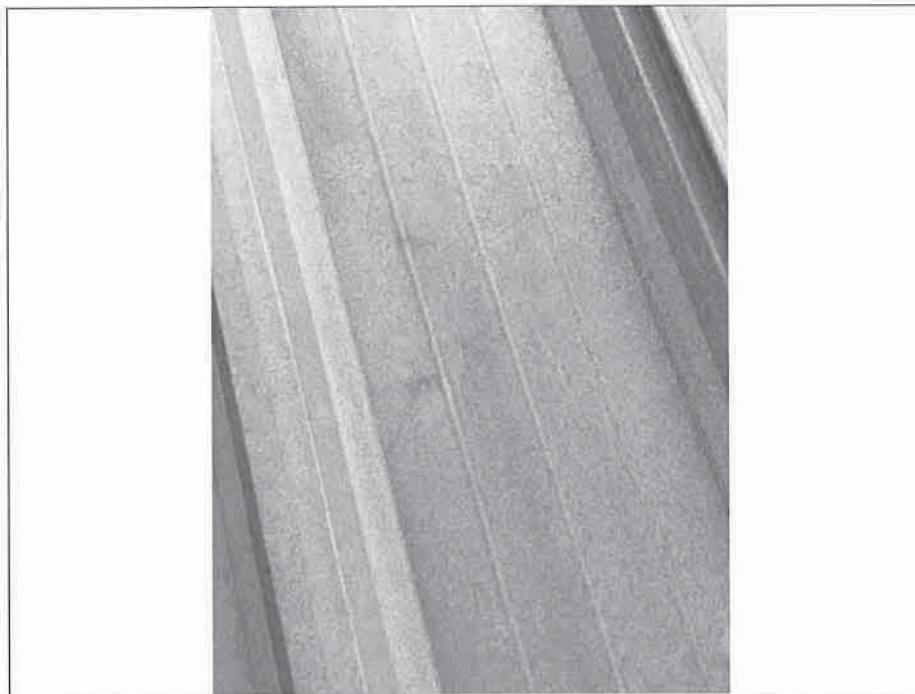


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Figure 39. (X)



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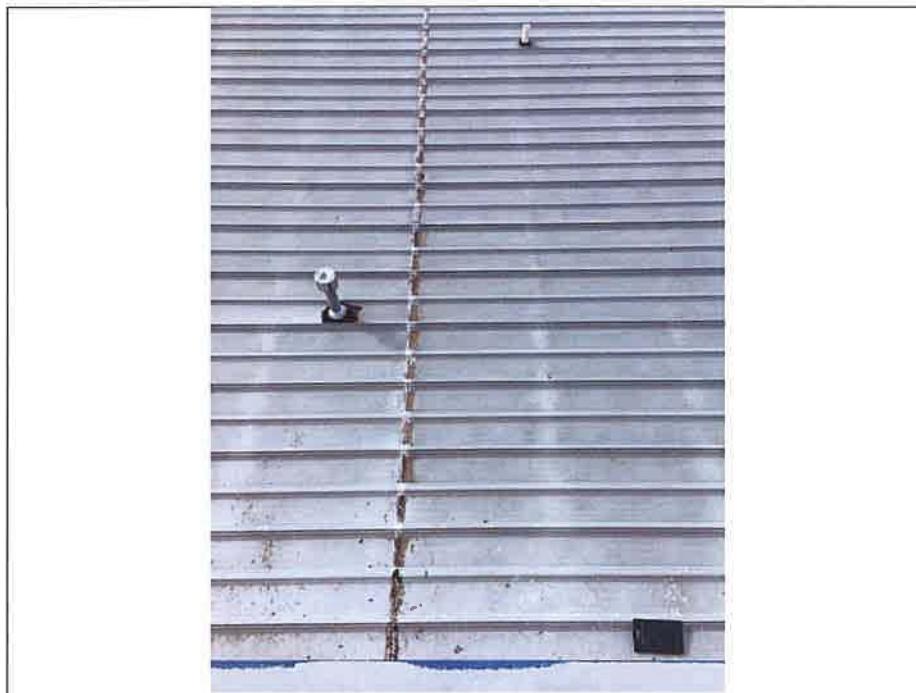


Figure 41. (X)



Figure 42. (X)

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Figure 43. (X)



Figure 44. (X)

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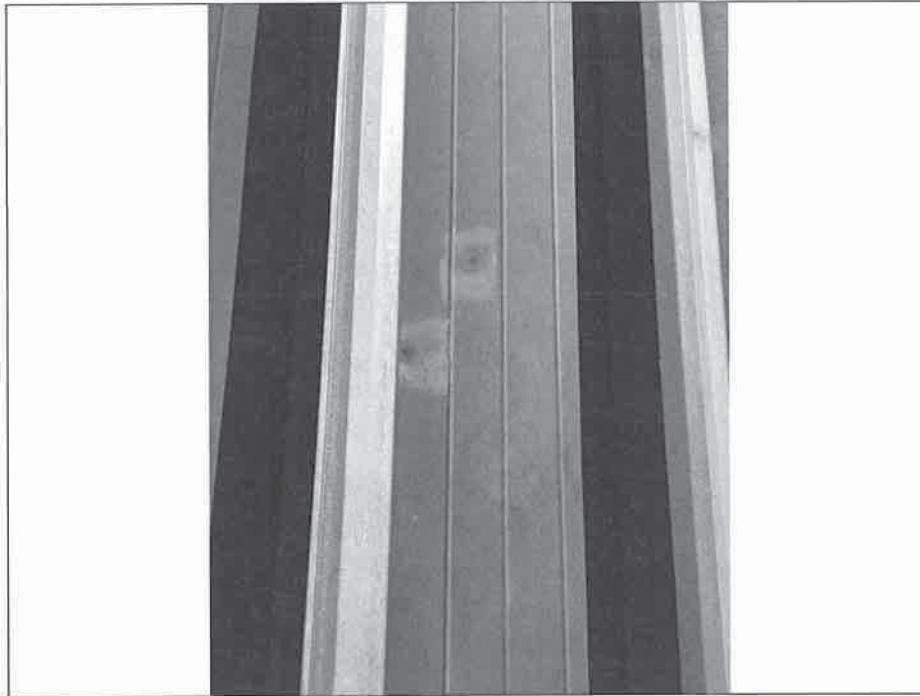


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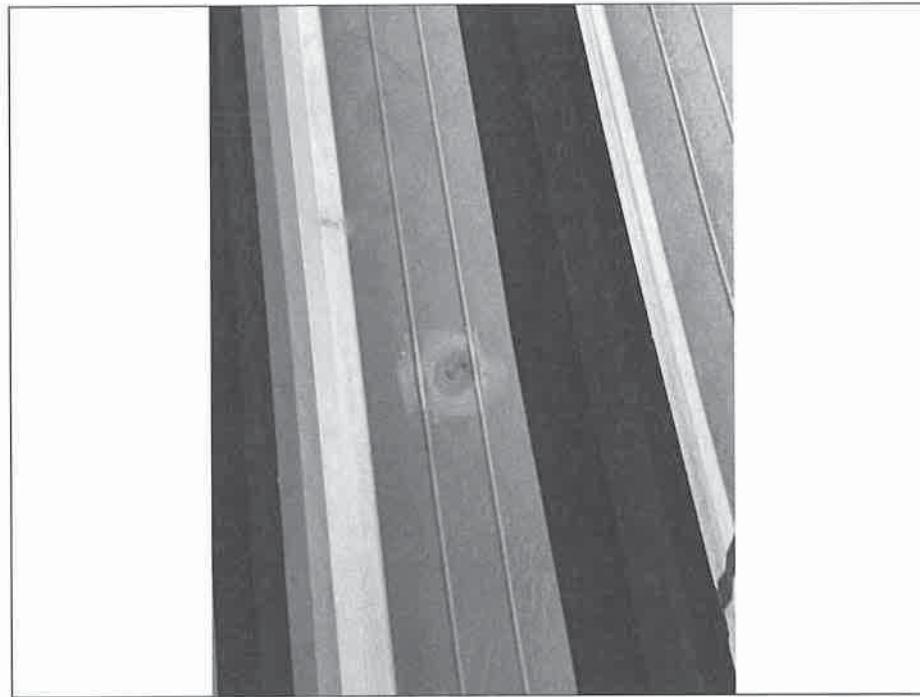


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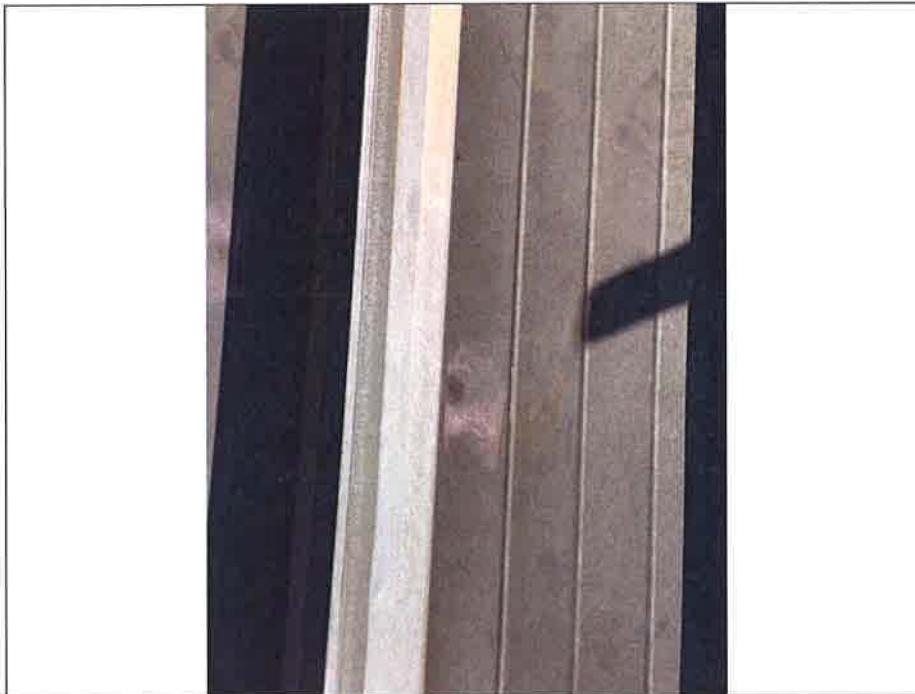


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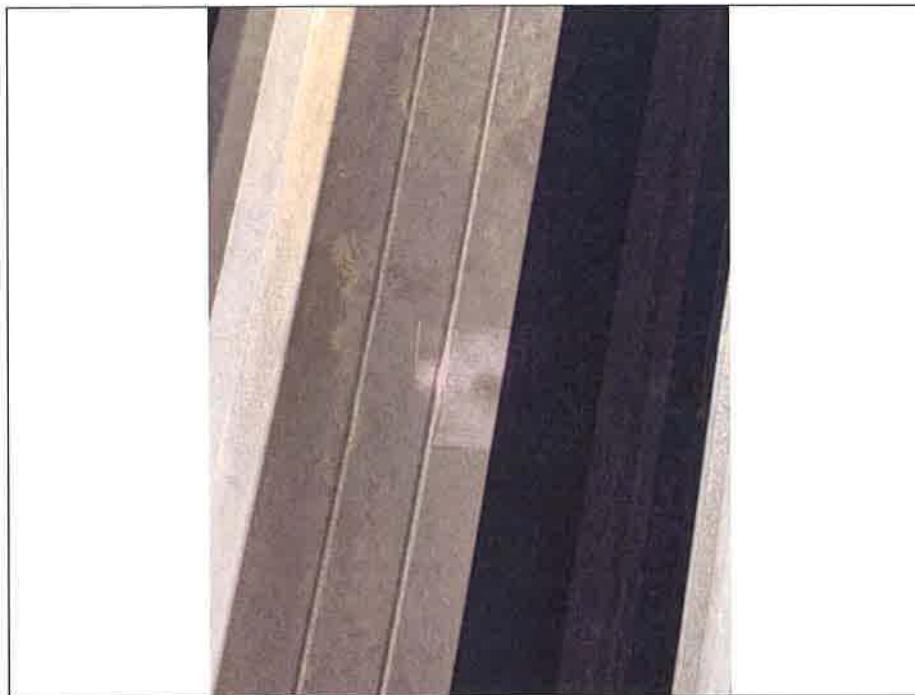


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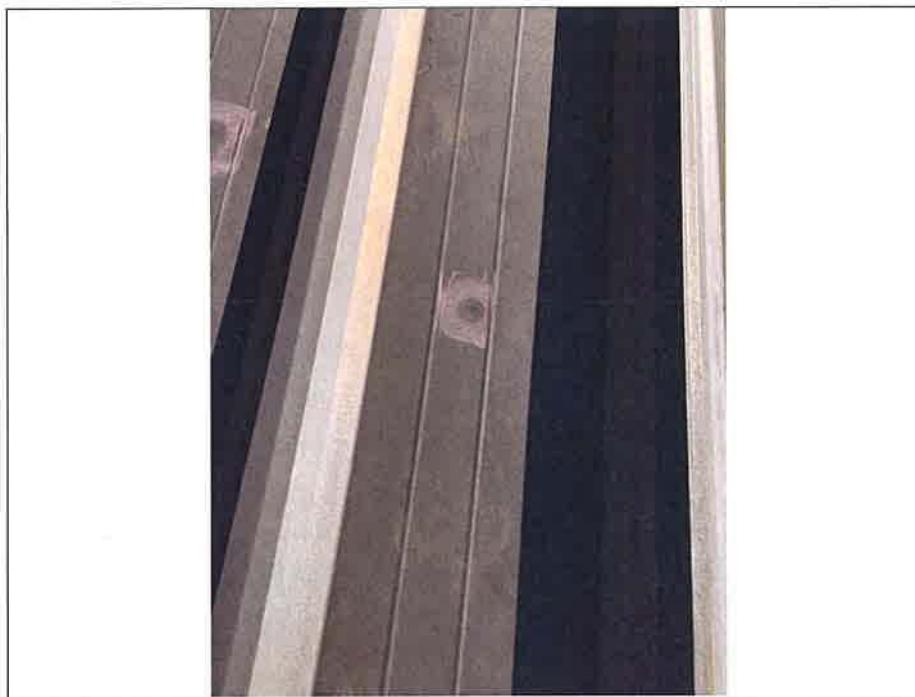


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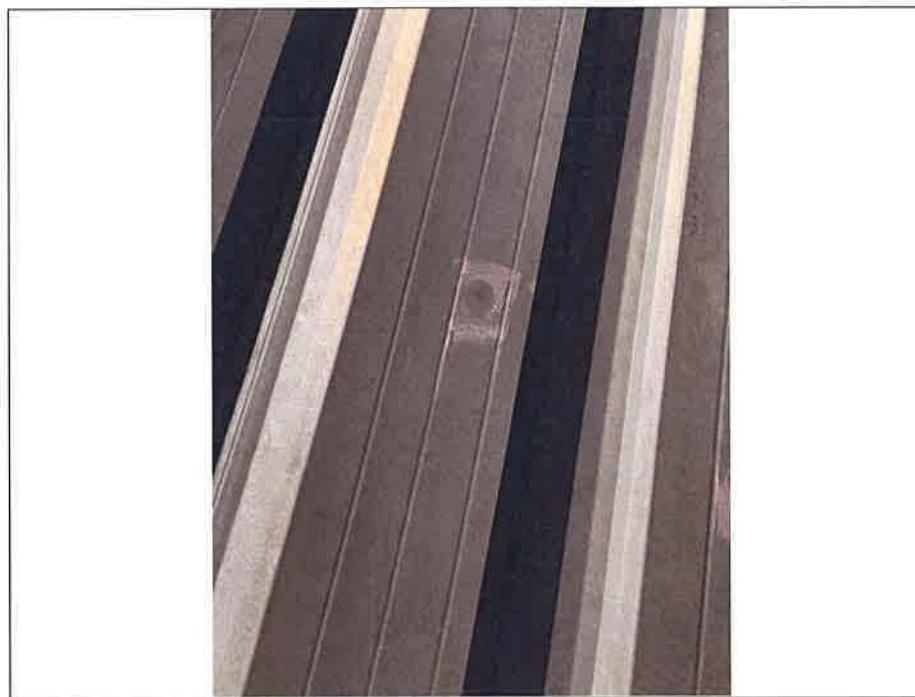


Figure 50. (X)

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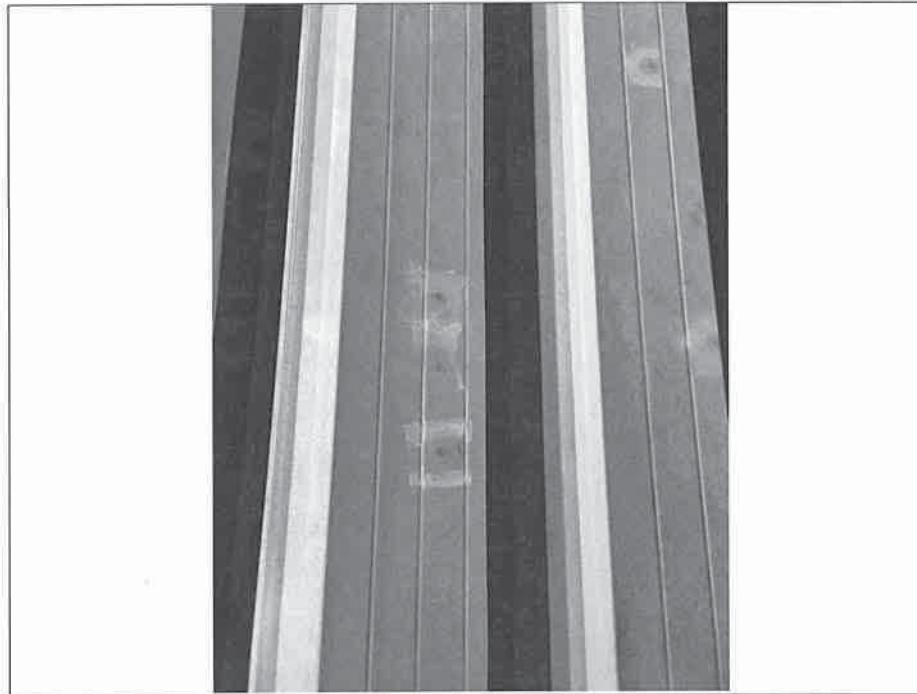


Figure 51. (X)

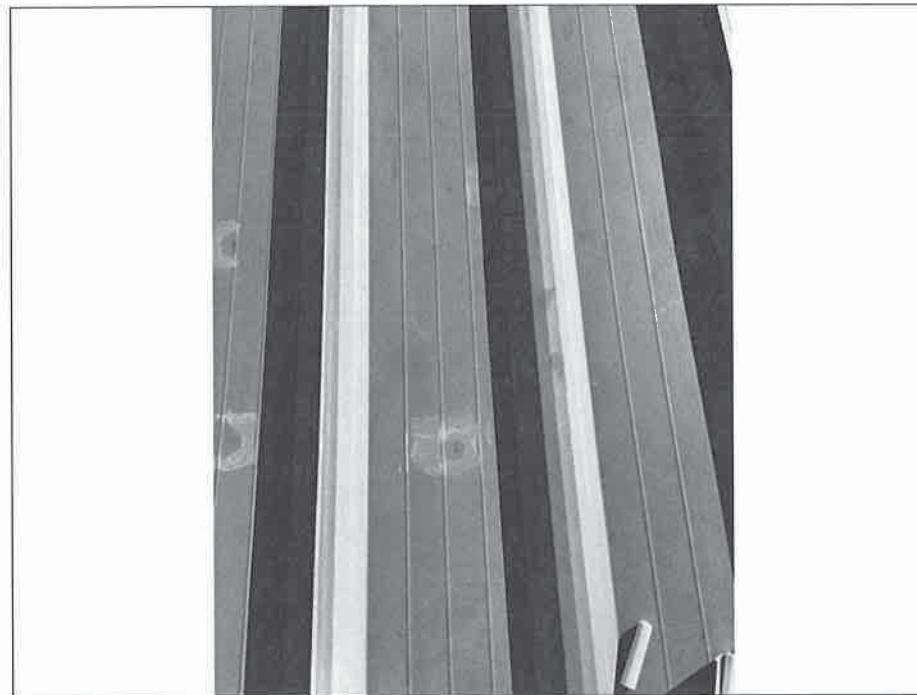


Figure 52. (X)

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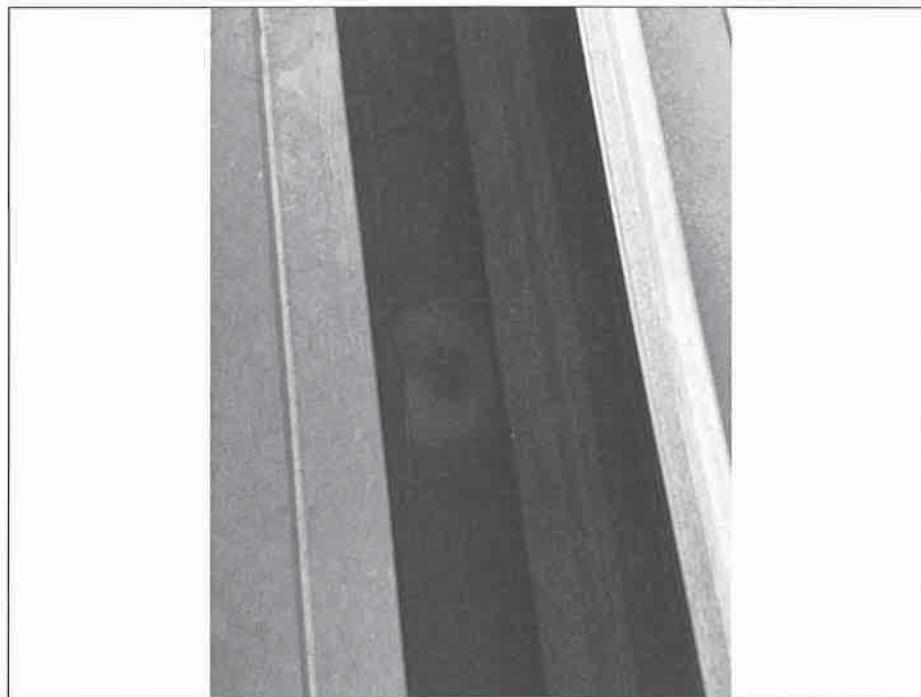


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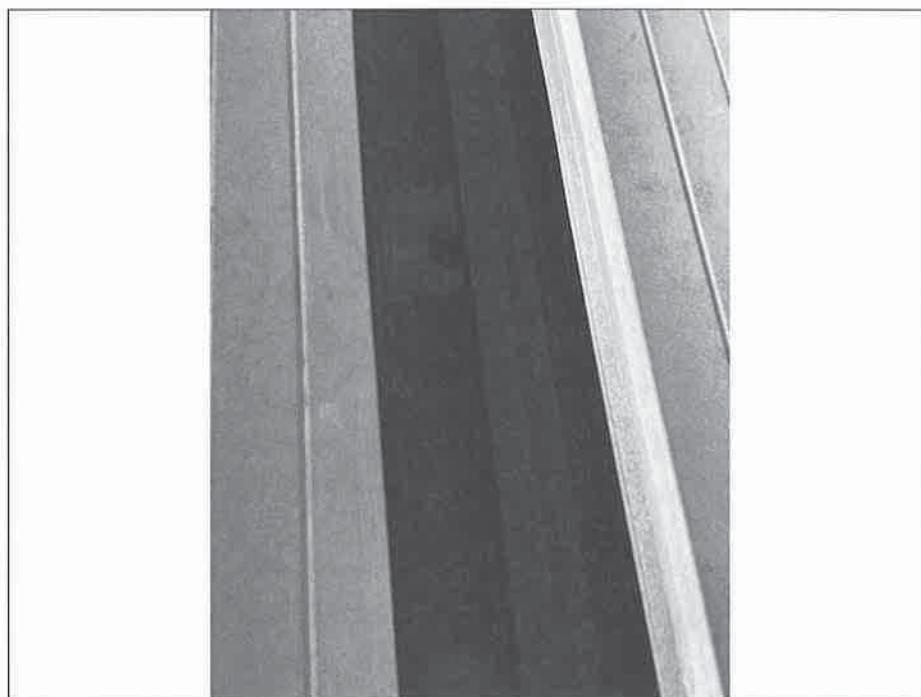


Figure 54. (X)

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Figure 55. (X)

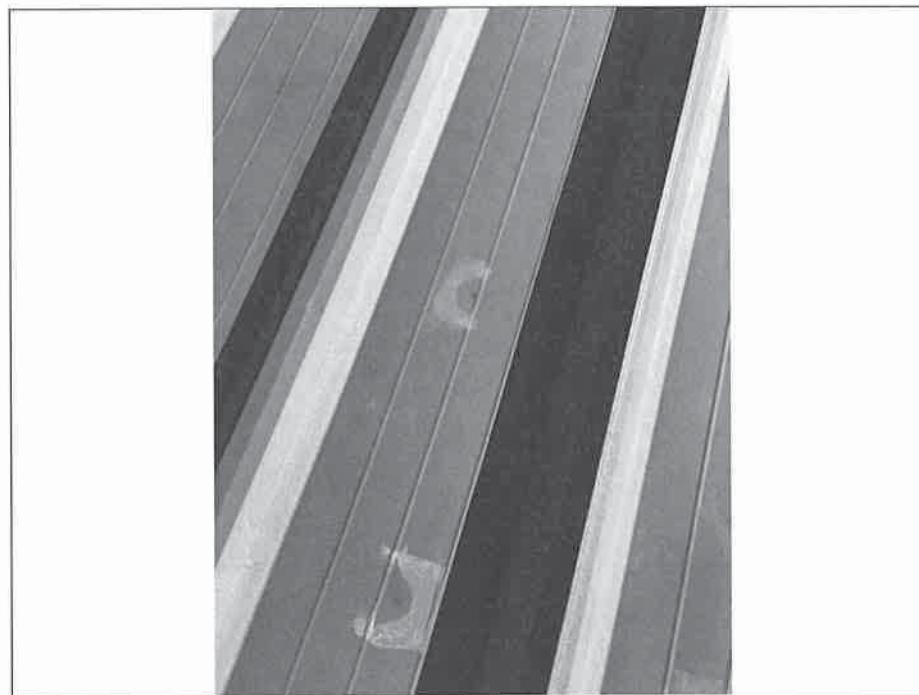


Figure 56. (X)

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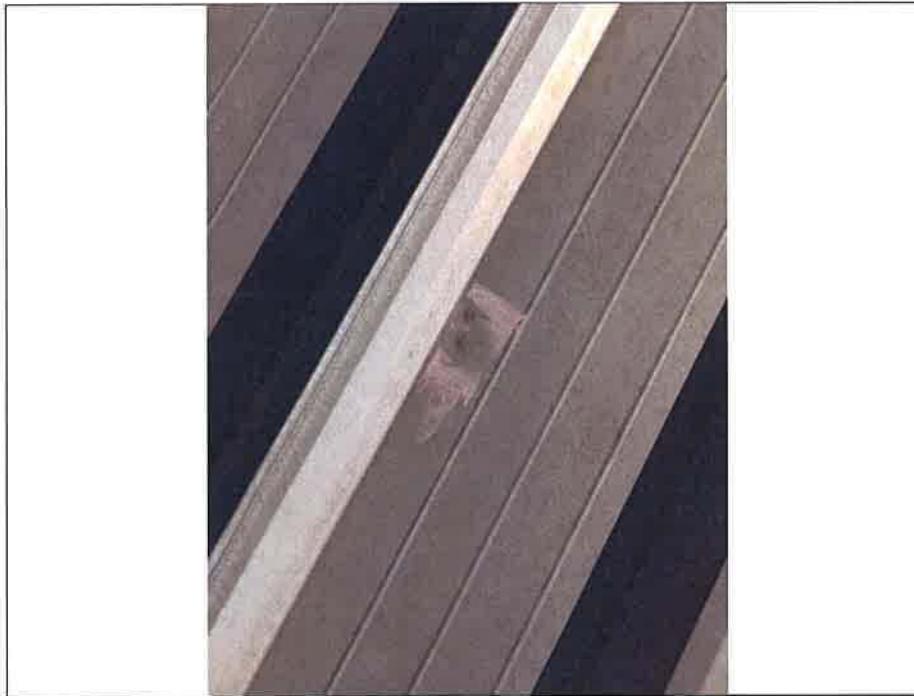


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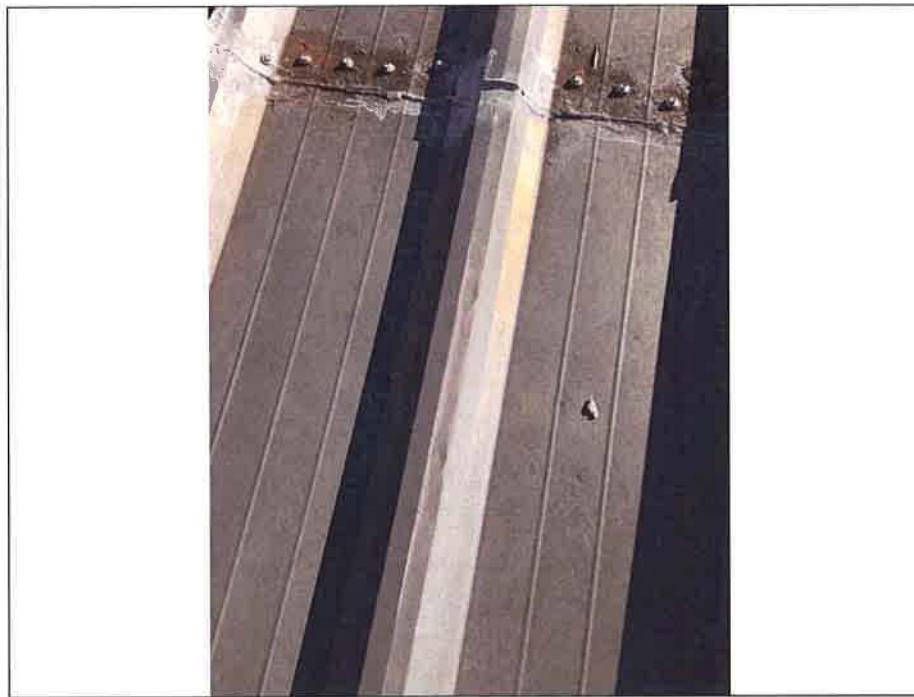


Figure 58. (X)

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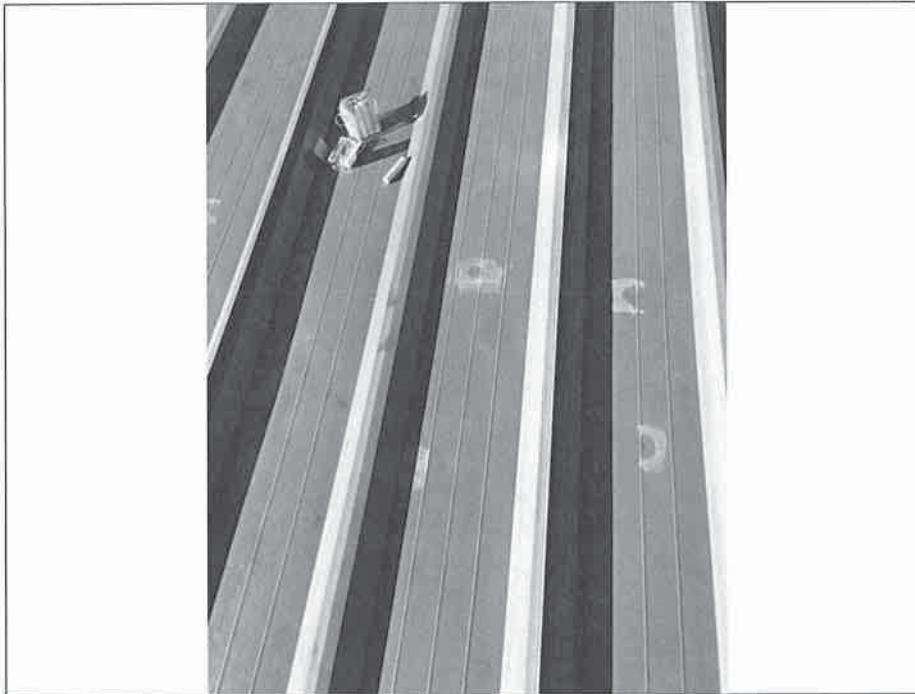


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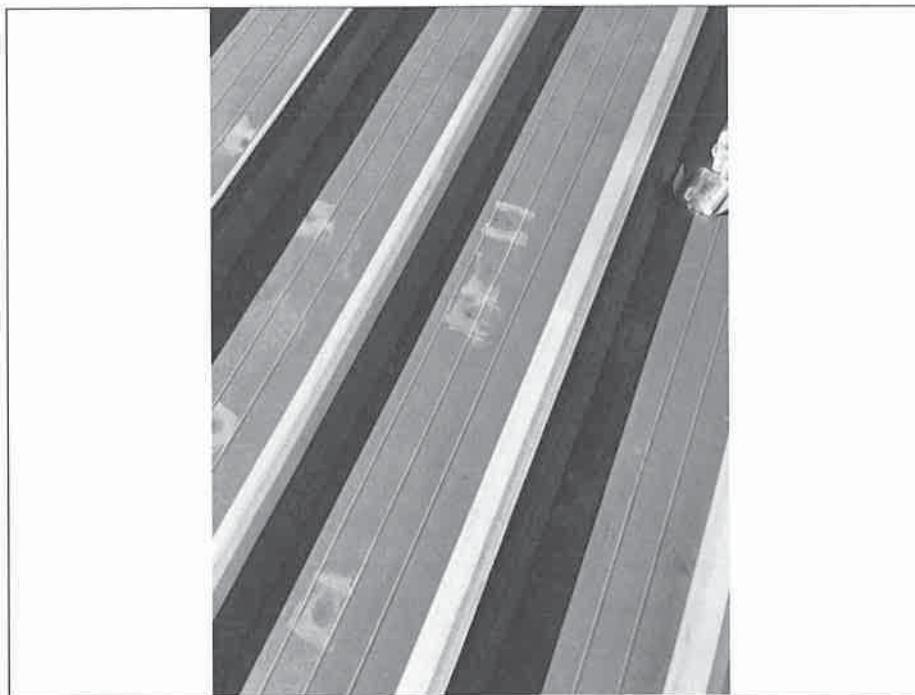


Figure 60. (X)

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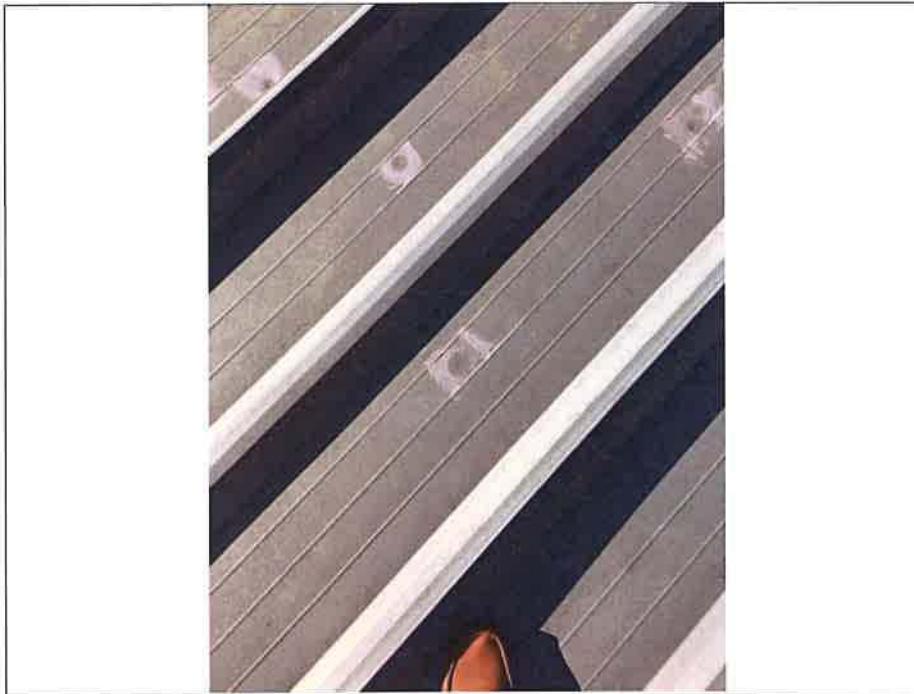


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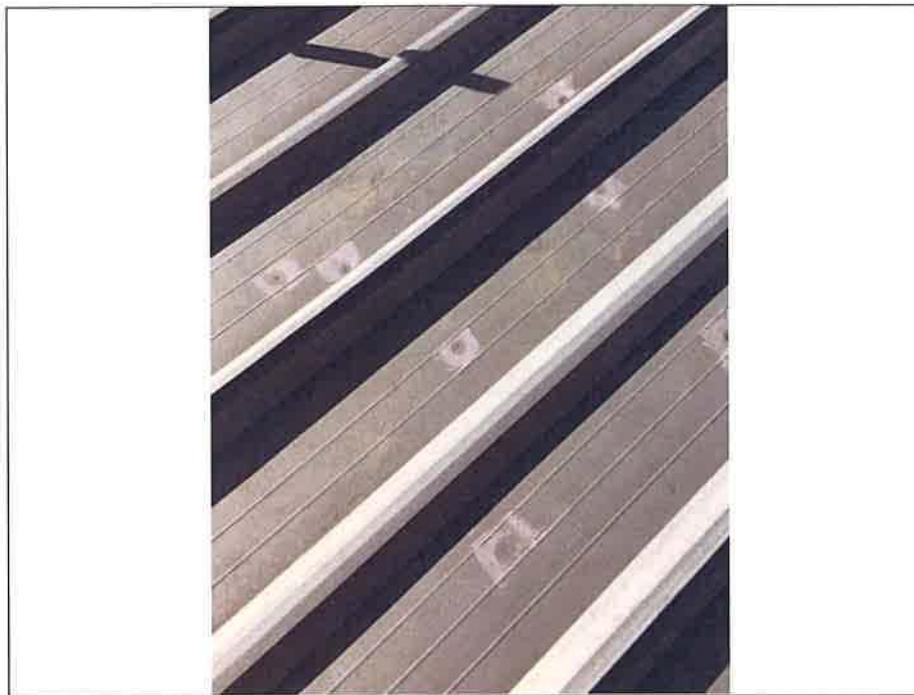


Figure 62. (X)

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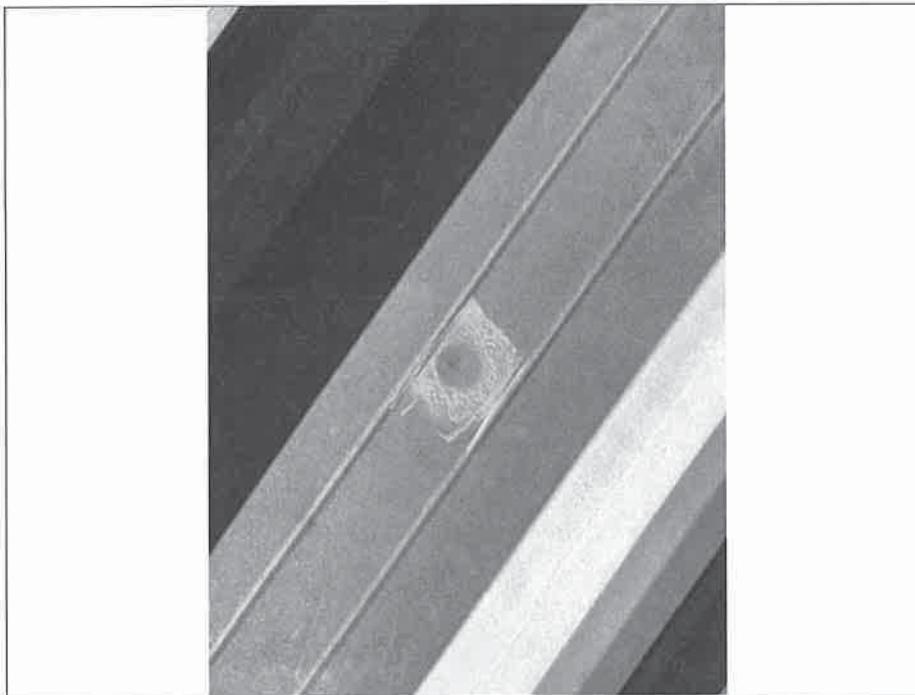


Figure 63. (X)

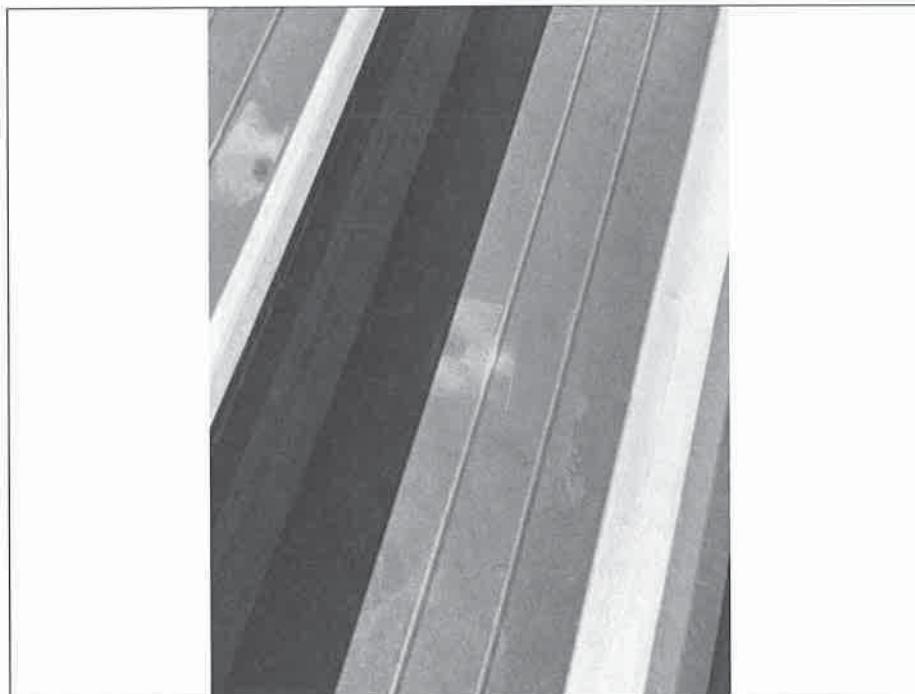


Figure 64. (X)

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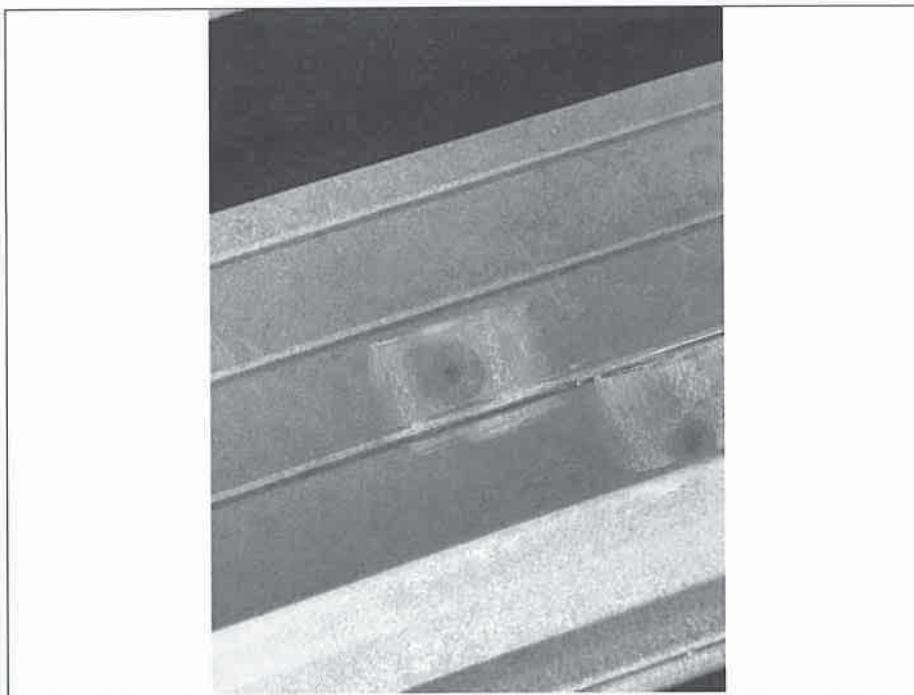


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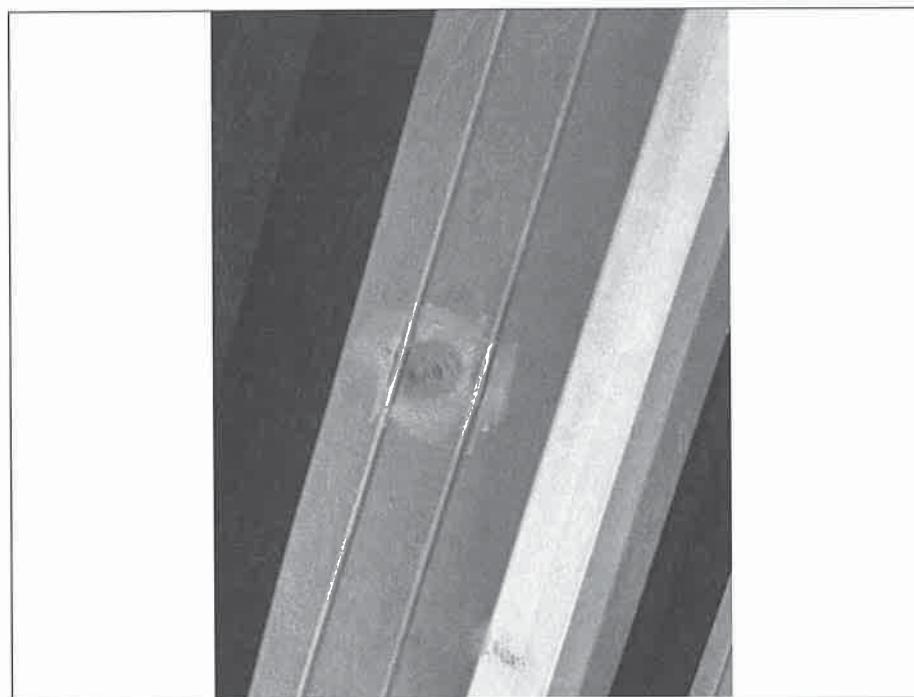


Figure 66. (X)

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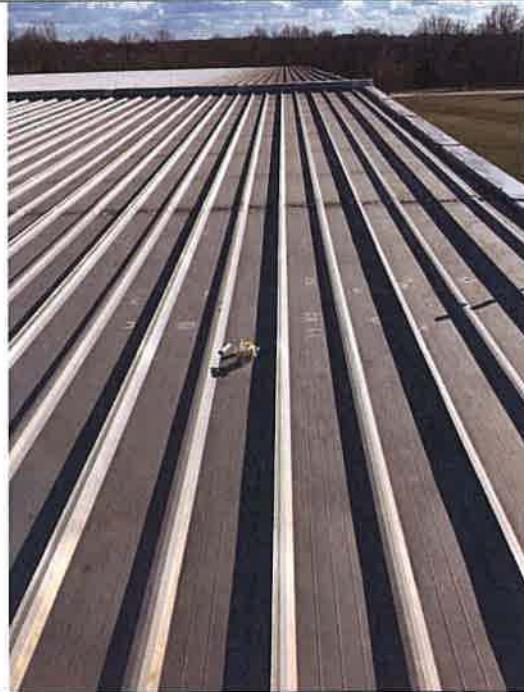


Figure 67. (X)



Figure 68. (X)